Tentative Agenda

6th world Congress on Materials science and Engineering

Materials Info 2023

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List of University and Organization of Participants

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Investigation of natural vein quartz as an anode electrode material in lithium-ion rechargeable batteries

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Abstract

In response to the high demand for batteries with high energy density, researchers are looking for alternative anode materials for standard lithium-ion batteries with high theoretical capacity, stability and charging rate capabilities. One of the promising anode materials is silicon dioxide which has 1950 mAh g^{-1} theoretical gravimetric capacity at the highest lithiated form. Even though pure vein quartz deposits are situated in Sri Lanka, the applicability of Sri Lankan vein quartz (SLVQ) into rechargeable lithium-ion batteries and investigating its electrochemical performance has not been investigated yet. Therefore, the electrochemical performance of half cells developed using SLVQ is being investigated in this study. The electrochemical performance of the half cells was studied employing cyclic voltammetry (CV), electrochemical impedance spectroscopy (EIS), and galvanostatic charging and discharging. CV studies reveal the partial reduction, solid electrolyte interphase formation, reduction and oxidation of the half-cell around 1.3, 0.8, 0.24 and 0.2 V. Specific discharge capacity of the first cycle was manifested at 148.1 mAh g^{-1} and the specific charge capacity was at 32.6 mAh g^{-1} with the initial coulombic efficiency of 22 %. Galvanostatic discharging and charging reveal smooth cycling after a few initial cycles. This study reveals the potentiality of SLVQ for rechargeable lithium-ion batteries. Nevertheless, detailed and in-depth research is required to determine SLVQ's full capability using for high-energy-density rechargeable batteries.

Y.M.I.B. Samarakoon is currently a Research Assistant attached to the National Center for Advanced Battery Research of the National Institute of Fundamental Studied (NIFS). He obtained his first degree from the Institute of Chemistry, Ceylon in 2013 and MSc in Nuclear Science from University of Colombo in 2018. He joined the NIFS in 2019 and is now reading for his M.phil. Degree from the Postgraduate Institute of Science, University of Peradeniya. His research focuses on purification and modification of natural vein quartz in Sri Lanka for energy conversion applications and modeling and simulation of materials and liquids. His research interests include minerals, nanomaterials, renewable energy, electrochemistry, understanding chemical and physical phenomena of materials and liquids using in-silico methods.

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